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(71) Applicant: **Oki Electric Industry Co., Ltd.**
Tokyo (JP)

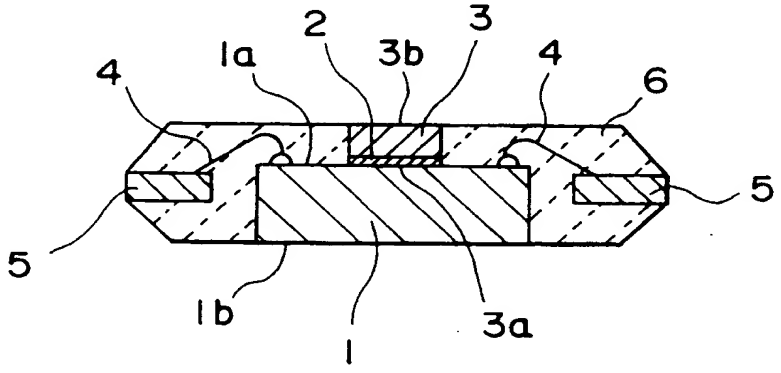
(72) Inventors:
- **Yamada, Etsuo, c/o Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)
- **Shiraishi, Yasushi, Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)
- **Kawano, Hiroshi,**
  c/o Oki Electric Industry Co.Ltd.
  Tokyo 105 (JP)
- **Ohuchi, Shinji, c/o Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)
- **Nasu, Hidekazu, c/o Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)

(74) Representative: **Read, Matthew Charles et al**
Venner Shipley & Co.
20 Little Britain
London EC1A 7DH (GB)

(54) Structure of resin molded type semiconductor

(57) A resin molded type semiconductor device according to the present invention comprises a chip support (3) face-bonded to one surface of a semiconductor element (1), which is connected to gold wires (4), with an adhesive tape (2), so as to avoid portions of the semiconductor element (1), which are connected to the gold wires (4), and a mold resin (6) for sealing the other surface of the semiconductor element (1), which is located on the opposite side of one surface thereof and a surface of the chip support (3), which is located on the opposite side of a surface thereof bonded to the semiconductor element (1), so as to expose both the other surface (1b) of the semiconductor element and the surface (3b) of the chip support (3). Owing to the above construction, a thinned semiconductor device can be obtained.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention:

This invention relates to a structure of a resin molded type semiconductor device.

Description of the Related Art:

An IC card and a memory card have been rapidly developed in recent years. With its rapid development, there has been a demand for a thin plastic or resin molded type semiconductor device mounted in the IC or memory card. A vast number of methods of making the resin molded type semiconductor device thinner have been also proposed. As one of the methods, there is known a structure of a semiconductor device disclosed in Japanese Patent Application Laid-Open No. 4-317360, for example, wherein lower surfaces of die pads are exposed without being covered with a mold resin. According to the above structure, the semiconductor device can be made thin by a thickness ranging from about 0.2mm to 0.3mm if the entire thickness of a package is regarded as about 1.0mm.

SUMMARY OF THE INVENTION

An object of the present invention is to cheaply provide a structure of a semiconductor device capable of preventing resin cracks from occurring, providing high reliability and making it thinner.

According to one aspect of the invention, for achieving the above object, there is provided a structure of a resin molded type semiconductor device, comprising:

a semiconductor element having a surface to which gold wires are connected;
a chip support fixed to the semiconductor element so as to avoid portions of the semiconductor element, which are respectively connected with the gold wires; and
a mold resin for sealing a back surface of the semiconductor element, which is located on the opposite side of the surface of the semiconductor element and a surface of the chip support, which is located on the side opposite to a surface thereof fixed to the semiconductor element, so as to expose both surfaces.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a vertical sectional side view of a resin molded type semiconductor device showing a first embodiment of the present invention;
Fig. 2 is a fragmentary plan view of a resin molded type semiconductor device illustrating a second embodiment of the present invention;
Fig. 3 is an enlarged vertical sectional side view taken along line A - A of Fig. 2;
Fig. 4 is a vertical sectional side view depicting a modification of the second embodiment of the present invention;
Fig. 5 is a fragmentary plan view of a resin molded type semiconductor device depicting a third embodiment of the present invention;
Fig. 6 is a vertical sectional side view illustrating a modification of the third embodiment of the present invention;
Fig. 7 is a vertical sectional side view of a resin molded type semiconductor device showing a fourth embodiment of the present invention;
Fig. 8 is a horizontal sectional view showing the resin molded type semiconductor device according to the fourth embodiment;
Fig. 9 is a horizontal side view illustrating a modification of the fourth embodiment of the present invention;
Fig. 10 is a horizontal sectional view of a resin molded type semiconductor device illustrating a fifth embodiment of the present invention;
Fig. 11 is a sectional view of a resin molded type semiconductor device illustrating a sixth embodiment of the present invention;
Fig. 12 is a sectional view of a resin molded type semiconductor device showing a seventh embodiment of the present invention;
Fig. 13 is a sectional view of a resin molded type semiconductor device depicting an eighth embodiment of the present invention;
Fig. 14 is a fragmentary plan view of a resin molded type semiconductor device showing a ninth embodiment of the present invention;
Fig. 15 is an enlarged vertical sectional side view taken along line A - A of Fig. 14; and
Fig. 16 is a sectional view of a resin molded type semiconductor device illustrating a tenth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will hereinafter be described in detail with reference to the accompanying drawings.

Fig. 1 is a schematic cross-sectional view showing a first embodiment of a plastic or resin molded type sem-

iconductor device according to the present invention. In Fig. 1, the semiconductor device comprises a semiconductor element 1 in which circuits are formed on the surface of silicon, a chip support 3 tightly fixed onto one surface 1a of the semiconductor element 1 wit an adhesive tape 2, leads 5 respectively electrically connected to A1 pads (bonding pads) formed on the one surface 1a of the semiconductor element 1 through gold wires (bonding wires) 4, and a mold resin 6 that seals the entire semiconductor device. The chip support 3 serves so as to reinforce the semiconductor element 1.

In this type of structure, the chip support 3 is provided so as to avoid areas or portions where the gold wires 4 are disposed and extend in the longitudinal direction of the semiconductor element 1 substantially along the center of the semiconductor element 1. Further, the chip support 3 is disposed so as to extend between substantially both ends of the semiconductor element 1. Upon sealing the semiconductor device with the mold resin 6, a structure is adopted in which the other surface located on the side opposite to one surface of the semiconductor element 1 and a surface of the chip support 3 located on the side opposite to a surface of the chip support 3, which is bonded to the semiconductor element 1, are respectively exposed and sealed with the mold resin 6.

A method of manufacturing the resin molded type semiconductor device shown in Fig. 1 will now be described. The chip support 3 is tightly disposed and fixed onto the semiconductor element 1 supported by an unillustrated support with the adhesive tape 2 interposed therebetween. In this case, the semiconductor element 1 and the chip support 3 are fixed to each other with an adhesive or an adhesive tape. The time required to dry the adhesive is spent when they are fixed to each other with the adhesive. On the other hand, when they are fixed to one another with the adhesive tape 2, drying becomes unnecessary.

Next, the unillustrated A1 pads formed on the semiconductor element 1 and the leads 5 are respectively electrically bonded to one another by the gold wires 4.

Thereafter, the entire semiconductor device from which parts of the leads 5 are eliminated, is sealed with the mold resin 6.

Finally, the resin molded type semiconductor device can be obtained by cutting and bending the leads 5 which project from the mold resin 6.

Thus, in the resin molded type semiconductor device showing the first embodiment of the present invention, the other surface 1b located on the side opposite to one surface 1a of the semiconductor element 1 and the surface 3b of the chip support 3 located on the side opposite to the surface 3a of the chip support 3, which is bonded to the semiconductor element 1, are exposed and sealed with the mold resin 6. Therefore, the thickness of a package can be reduced to a size obtained by simply adding the thicknesses of the semiconductor element 1, the adhesive tape 2 and the chip support 3 together, thereby making it possible to thin the semiconductor device. Since the distribution of the mold resin 6 is averaged, warpage of the semiconductor device, which occurs due to heat shrinkage, is hardly generated and the stress applied to the incorporated semiconductor element 1 can be also reduced.

Figs. 2 and 3 illustrate a second embodiment of a resin molded type semiconductor device according to the present invention. Fig. 2 is a fragmentary plan view of the second embodiment. Fig. 3 is a schematic enlarged sectional view taken along line A - A of Fig. 2. In Figs. 2 and 3, elements of structure indicated by reference numerals identical to those shown in Fig. 1 show the same ones as those shown in Fig. 1.

The semiconductor device comprises a semiconductor element 1 in which circuits are formed on the surface of silicon, a pair of chip supports 3 and 3 stuck fast to one surface of the semiconductor element 1 and fixed thereto with an adhesive 7, leads 5 respectively electrically connected to A1 pads (bonding pads) formed on one surface of the semiconductor element 1 through gold wires (bonding wires) 4, and a mold resin 6 that seals the entire semiconductor device. The pair of chip supports 3 and 3 serves so as to reinforce the semiconductor element 1.

In this type of structure, an interval x is defined between the pair of chip supports 3 and 3. The chip supports 3 and 3 are provided so as to avoid areas or portions where the gold wires 3 are disposed, and extend in the longitudinal direction of the semiconductor element 1 substantially along the center of the semiconductor element 1. Further, the pair of chip supports 3 and 3, and the pair of chip supports 3 and 3 and the semiconductor element 1 are respectively fixed to one another with the adhesive 7 injected into the interval x. Upon sealing the semiconductor device with the mold resin 6, a structure is adopted wherein the other surface 1b located on the side opposite to one surface 1a of the semiconductor element 1 and a surface 3b located on the side opposite to a surface 3a of the chip support 3, which is bonded to the semiconductor element 1, are respectively exposed and sealed with the mold resin 6.

A method of manufacturing the resin molded type semiconductor device shown in Figs. 2 and 3 will further be described. Firstly, the chip supports 3 are tightly placed on the semiconductor element 1 supported by an unillustrated support and are arranged in parallel to each other with the interval x defined therebetween.

Next, parts of both ends extending in the longitudinal direction of the semiconductor element 1 are left and the interval x is filled up with the adhesive 7. Thus, the pair of chip supports 3 and 3 and the semiconductor element 1 are brought into a tacked state.

The unillustrated A1 pads formed on the semiconductor element 1 and the leads 5 are then electrically bonded to each other by the gold wires 4.

Thereafter, the mold resin 6 is injected with a part in the interval x, which is unfilled with the adhesive 7 as

a mold injection port. Thus, the entire semiconductor device from which parts of the leads 5 are eliminated, is sealed with the mold resin 6. In this case, the mold resin 6 flows into the upper side of the adhesive 7 already charged into the interval x and hence the pair of chip supports 3 and 3 and the semiconductor element 1 are brought into a bonded state.

A final resin molded type semiconductor device is obtained by finally effecting cutting/bending processing on the leads 5 that project from the mold resin 6.

Thus, in the resin molded type semiconductor device showing the second embodiment of the present invention, the other surface 1b located on the side opposite to one surface 1a of the semiconductor element 1 and the surface 3b of the chip support 3 located on the side opposite to the surface 3a of the chip support 3, which is bonded to the semiconductor element 1, are exposed and sealed with the mold resin 6. Therefore, the thickness of a package can be reduced to a size obtained by simply adding the thicknesses of the semiconductor element 1 and the chip support 3 together, thereby making it possible to thin the semiconductor device. Since the distribution of the mold resin 6 is averaged, warpage of the semiconductor device, which occurs due to heat shrinkage, is hardly generated and the stress applied to the incorporated semiconductor element 1 can be also reduced.

Further, since the structure is adopted wherein the mold resin 6 is injected with the part in the interval x unfilled with the adhesive 7 as the mold injection port and the entire semiconductor device from which the parts of the leads 5 are eliminated, is sealed with the mold resin 6, the mold resin 6 flows into the upper side of the adhesive 7 already poured into the interval x and hence the pair of chip supports 3 and 3 and the semiconductor element 1 are firmer bonded to one another.

Fig. 4 is a schematic sectional view of a resin molded type semiconductor device showing one modification of the second embodiment of the present invention. In Fig. 4, elements of structure identified by reference numerals identical to those shown in Figs. 2 and 3 show the same ones as those shown in Figs. 2 and 3.

In the illustrated modification, chip supports 3 and 3 provided in a pair have cut-away portions respectively. Further, the chip supports 3 respectively have horizontal and vertical portions 3A and 3B and are substantially L-shaped in cross-section. The pair of chip supports 3 and 3 are disposed on the semiconductor element 1 in a state in which tips of the horizontal portions 3A are opposed to each other. Further, an interval is defined between each horizontal portion 3A and the semiconductor element 1 so as to be filled with an adhesive 7 and a mold resin 6, so that an area that contributes to bonding, is increased.

Thus, the structure of this modification can bring about advantageous effects that the bonding between the pair of chip supports 3 and 3 and the semiconductor element 1 is made firmer, as well as advantageous effects obtained by the structure shown in Figs. 2 and 3.

Fig. 5 is a fragmentary plan view showing a third embodiment of a resin molded type semiconductor device according to the present invention. In Fig. 5, elements of structure indicated by reference numerals identical to those shown in Figs. 1 through 4 show the same ones as those illustrated in Figs. 1 through 4.

The semiconductor device includes a semiconductor element 1 in which circuits are formed on the surface of silicon, and a plurality of chip supports 3 tightly placed on one surface of the semiconductor element 1 and fixed thereto with an adhesive 7. Further, the semiconductor device has leads respectively electrically connected to unillustrated A1 pads (bonding pads) formed on one side or surface of the semiconductor element 1 through gold wires (bonding wires). Furthermore, the entire semiconductor device is constructed so as to be sealed with a mold resin 6.

In this structure, adhesive injection holes 8 are respectively defined in tips of the chip supports 3. The individual chip supports 3 are tightly placed on one surface 1a of the semiconductor element 1. Further, the adhesive 7 is injected through the adhesive injection holes 8 so as to bond between the chip supports 3 and the semiconductor element 1. The chip supports 3 serve as reinforcing materials for the semiconductor element 1. Upon sealing the semiconductor device with the mold resin 6, a structure is adopted in which the other surface 1b located on the side opposite to one surface 1a of the semiconductor element 1 and a surface 3b of each chip support 3 located on the side opposite to a surface 3a thereof bonded to the semiconductor element 1, are respectively exposed and sealed with the mold resin 6.

Thus, in the resin molded type semiconductor device showing the third embodiment of the present invention, the other surface 1b located on the side opposite to one surface 1a of the semiconductor element 1 and the surface 3b of each chip support 3 located on the side opposite to the surface 3a thereof bonded to the semiconductor element 1, are exposed and sealed with the mold resin 6. Therefore, the thickness of a package can be reduced to a size obtained by simply adding the thicknesses of the semiconductor element 1 and the chip supports 3 together, thereby making it possible to thin the semiconductor device. Since the mold resin 6 is distributed on the average, warpage of the semiconductor device, which occurs due to heat shrinkage, is hardly produced and the stress applied to the incorporated semiconductor element 1 can be also reduced.

Fig. 6 is a schematic sectional view of a resin molded type semiconductor device shown as one modification of the third embodiment according to the present invention. In Fig. 6, elements of structure indicated by reference numerals identical to those shown in Figs. 1 through 5 show the same ones as those shown in Figs. 1 through 5.

In the illustrated modification, chip supports 3 having adhesive injection holes 8 defined in tips thereof ex-

tend from the four corners (substantially symmetrical as seen from left to right side although only about the half of the semiconductor device is shown in Fig. 6) of a semiconductor element 1 so as to avoid areas or portions where gold wires (not shown) are provided. The chip supports 3 are bonded to one surface 1a of the semiconductor element 1 with an adhesive 7 injected through adhesive injection holes 8. The present embodiment is identical in structure to the third embodiment in that the chip supports 3 are used as reinforcing materials for the semiconductor element 1 and other features exist.

Figs. 7 and 8 show a fourth embodiment of a resin molded type semiconductor device according to the present invention. Fig. 7 is a schematic vertical sectional side view of the fourth embodiment. Fig. 8 is a schematic horizontal sectional view of the fourth embodiment. In Figs. 7 and 8, elements of structure indicated by reference numerals identical to those shown in Figs. 1 through 6 show the same ones as those shown in Figs. 1 through 6.

Referring to Figs. 7 and 8, the semiconductor device comprises a semiconductor element 1 in which circuits are formed on the surface of silicon, die pads 9 divided into three which are tightly placed on the other surface 1b of the semiconductor element 1 and fixed thereto with an adhesive 7, leads 5 respectively electrically connected to A1 pads (bonding pads) formed on one surface of the semiconductor element 1 through gold wires (bonding wires) 4, and a mold resin 6 that seals the entire semiconductor device. The three die pads 9 serve so as to reinforce the semiconductor element 1.

In this type of structure, the three die pads 9 extend in the longitudinal direction of the semiconductor device with intervals x defined therebetween. Further, the three die pads 9 are disposed so as to extend between substantially both ends of the semiconductor element 1. The adhesive 7 poured into the intervals x fix between the die pads 9 and between the die pads 9 and the semiconductor element 1. Upon sealing the semiconductor device with the mold resin 6, a structure is adopted in which a surface 9b located on the side opposite to a surface 9a of each die pad 9, which is bonded to the semiconductor element 1, is exposed and sealed with the mold resin 6.

A method of manufacturing the resin molded type semiconductor device shown in Figs. 7 and 8 will further be described. The semiconductor element 1 is first placed on the three die pads 9 supported by an unillustrated support and provided in parallel to each other with the intervals x defined therebetween so as to extend across the three die pads 9. Further, the semiconductor element 1 is tightly fixed to the die pads 9 with the adhesive 7 so as to temporarily affix between the die pads 9 and the semiconductor 1.

Next, the unillustrated A1 pads formed on the semiconductor element 1 and the leads 5 are electrically bonded to each other through the gold wires 4.

Thereafter, the intervals x are filled with the mold resin 6. Thus, the entire semiconductor device from which parts of the leads 5 are eliminated, is sealed with the mold resin 6. In this case, the mold resin 6 also flows into each interval x defined between the adjacent divided die pads 9.

The leads 5 that project from the mold resin 6, are finally bent so as to obtain a final resin molded type semiconductor device.

Thus, in the resin molded type semiconductor device shown as the fourth embodiment of the present invention, the other surface of each die pad 9 provided on the other surface 1b located on the side opposite to one surface 1a of the semiconductor element 1, is exposed and sealed with the mold resin 6.

Therefore, the thickness of a package can be reduced, thus making it possible to thin the semiconductor device. Since the mold resin 6 is poured into each interval x defined between the adjacent divided die pads 9 and hence the distribution of the mold resin 6 is averaged, warpage of the semiconductor device, which occurs due to heat shrinkage, is hardly generated and the stress applied to the incorporated semiconductor element 1 can be also reduced.

Fig. 9 is a schematic sectional view of a resin molded type semiconductor device showing one modification of the fourth embodiment according to the present invention. In Fig. 9, elements of structure indicated by reference numerals identical to those shown in Figs. 1 through 8 show the same ones as those shown in Figs. 1 through 8.

In the present modification, die pads 9 divided into four are used. The four die pads 9 extend from the four corners of a semiconductor element 1 and are bonded to one surface 1b of the semiconductor element 1 with an adhesive 7. In regard to other points, the present modification is identical in structure to the fourth embodiment.

Fig. 10 illustrates a fifth embodiment of a resin molded type semiconductor device according to the present invention. Fig. 10 is a schematic horizontal sectional view of the fifth embodiment. In Fig. 10, elements of structure designated at reference numerals identical to those shown in Figs. 1 through 9 show the same ones as those shown in Figs. 1 through 9.

Referring to Fig. 10, the semiconductor device is of a semiconductor device having a LOC (Lead On Chip) structure. The semiconductor device comprises a semiconductor element 1 in which circuits are formed on the surface of silicon, a plurality of leads 5 which are tightly placed on one surface 1a of the semiconductor element 1 with adhesive injection holes 10 defined in tips thereof and are respectively fixed onto the whole surface of the semiconductor element 1 with an adhesive 7 injected into the adhesive injection holes 10, gold wires (bonding wires) for respectively connecting A1 pads (bonding pads) formed on one side of the semiconductor element 1 and the leads 5 to one another, and a mold resin 6 that

seals the entire semiconductor device. The leads 5 tightly stuck to the semiconductor element 1 serve as for reinforcement.

A method of fabricating the resin molded type semiconductor device shown in Fig. 10 will be further described. The leads 5 are first located in predetermined positions of one surface 1a of the semiconductor element 1 and the adhesive 7 is injected through the adhesive injection holes 10 so as to temporarily affix the semiconductor element 1 and the leads 5. Next, the unillustrated A1 pads formed on the semiconductor element 1 and the leads 5 are electrically bonded to one another by the gold wires 4.

Thereafter, the mold resin 6 is poured so as to seal the entire semiconductor device from which parts of the leads 5 are excluded.

Finally, the leads 5 that project from the mold resin 6, are cut and bent so as to obtain a final resin molded type semiconductor device.

Thus, since the resin molded type semiconductor device shown as the fifth embodiment has a structure in which the leads 5 having the adhesive injection holes 10 respectively defined in the tips thereof are tightly placed on one surface 1a of the semiconductor element 1, the semiconductor element 1 and the leads 5 are bonded to one another with the adhesive 7 poured through the adhesive injection holes 10 and thereafter the semiconductor device is sealed with the mold resin 6, the electrical connection between the semiconductor element 1 and the leads 5 can be made without using an adhesive tape and hence the cost of processing the adhesive tape can be reduced.

Fig. 11 is a schematic enlarged sectional view showing a sixth embodiment of a resin molded type semiconductor device according to the present invention. In Fig. 11, elements of structure indicated by reference numerals identical to those shown in Fig. 1 show the same ones as those shown in Fig. 1.

In the sixth embodiment, a projection is formed on the surface of the chip support 3 opposite to the surface thereof bonded to the chip, which is bonded to the upper surface of the semiconductor element 1 employed in the first embodiment. Fig. 11 shows the case where a chip support 63 having a convex cross-section is used as one example of the projection. A method of fabricating the resin molded type semiconductor device according to the sixth embodiment is identical to the method of manufacturing the semiconductor device according to the first embodiment. A convex sectional form of the chip support 63 can be formed by effecting halfetching on the same chip support as that employed in the first embodiment. Owing to the shaping of the cross-section of the chip support in the form of the convex, an interface surface between the chip support and a mold resin can be made longer and the adhesion therebetween can be improved when the semiconductor element 1 and the chip support 63 are sealed with the mold resin. It is therefore possible to prevent moisture from entering from the outside.

Figs. 12 and 13 are respectively schematic enlarged sectional views showing seventh and eighth embodiments of resin molded type semiconductor devices according to the present invention. In Figs. 12 and 13, elements of structure indicated by reference numerals identical to those shown in Fig. 1 show the same ones as those shown in Fig. 1.

The seventh embodiment shown in Fig. 12 is identical in manufacturing method to the first embodiment. As an adhesive for bonding a chip support 3 formed on an upper surface of a semiconductor element 1 to a semiconductor element 1, a rubber-like adhesive having a Young's modulus of about 10kg/mm^2 is used. The adhesive 11 is formed by being applied to the upper surface of the semiconductor element 1 during a manufacturing operation. In the eighth embodiment shown in Fig. 13, an adhesive 12 is of a tape-like one and is bonded to a chip support 3 in advance. The tape-like adhesive 12 also has a Young's modulus of about 10kg/mm^2 in a manner similar to the rubber-like adhesive 11 employed in the seventh embodiment.

When elastic adhesives are used as the adhesives provided between the semiconductor elements 1 and the chip supports 3 as in the case of the seventh and eighth embodiments respectively, the adhesives serve as cushioning materials even if a mold is brought into contact with the reverse side of the chip support 3 or the semiconductor element 1 upon mold clamping under resin sealing, so that a large force is prevented from applying to the semiconductor element 1 and the chip support 3. It is therefore possible to prevent cracks from occurring in the reverse side of the semiconductor element 1.

Figs. 14 and 15 illustrate a ninth embodiment of a resin molded type semiconductor device according to the present invention. Fig. 14 is a fragmentary plan view of the resin molded type semiconductor device. Fig. 15 is a schematic enlarged sectional view taken along line A - A of Fig. 2. In Figs. 14 and 15, elements of structure indicated by reference numerals identical to those shown in Fig. 1 show the same ones as those shown in Fig. 1.

In the resin molded type semiconductor device according to the ninth embodiment, a metal plate 13 is bonded onto an upper surface of a semiconductor element 1. In the ninth embodiment as well, a mold is brought into direct contact with an upper surface of the metal plate 13 and a lower surface of the semiconductor element 1 and interposed therebetween upon mold clamping under resin sealing. Accordingly, the vertical dimension of the mold is substantially determined by the metal plate 13 and the semiconductor element 1. Since the metal plate 13 is provided separately from leads, the metal plate 13 can be formed so as to become thinner than each of leads. It is therefore possible to make the entire semiconductor device thinner. Assuming now that the thickness of the metal plate 13 is 0.1mm, the thick-

ness of an adhesive tape 2 is 0.1mm and the thickness of the semiconductor element 1 is 0.3mm, an ultra-thin semiconductor device whose entire thickness is 0.5mm can be achieved.

Since the metal plate 13 is independent of the leads, the metal plate 13 can utilize a material different from that used for the leads. The thermal resistance of the semiconductor device can be lowered by using, for example, a high-radiative material such as Cu, Al, Cu/W or the like as the material.

Fig. 16 is a schematic enlarged sectional view illustrating a tenth embodiment of a resin molded type semiconductor device according to the present invention. In Fig. 16, elements of structure indicated by reference numerals identical to those shown in Fig. 1 show the same ones as those shown in Fig. 1.

The tenth embodiment shown in Fig. 16 is identical in manufacturing method to the first embodiment. However, the form of a chip support 3 formed on and bonded to an upper surface of a semiconductor element 1 is different from that of the chip support 3 employed in the first embodiment. Namely, the chip support 3 is half-etched and an adhesive tape is provided within a half-etched area thereby to bond the chip support 3 to the semiconductor element 1. By half-etching the portion of the chip support 3, which is bonded to the semiconductor element 1 as described above, the thickness of the entire semiconductor device can be made thin by a thickness corresponding to the amount of halfetching.

While the present invention has been described with reference to the illustrative embodiments, this description is not intended to be construed in a limiting sense. Various modifications of the illustrative embodiments, as well as other embodiments of the invention, will be apparent to those skilled in the art on reference to this description. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as fall within the true scope of the invention.

Claims

1. A structure of a resin molded type semiconductor device, comprising:

   a semiconductor element having a surface to which gold wires are connected;
   a chip support fixed to the semiconductor element so as to avoid portions of said semiconductor element, which are respectively connected to the gold wires; and
   a mold resin for sealing a back surface of said semiconductor element, which is located on the opposite side of the surface of said semiconductor element and a surface of said chip support, which is located on the side opposite to a surface thereof fixed to said semiconductor element, so as to expose said both surfaces.

2. A structure of a resin molded type semiconductor device, comprising:

   a semiconductor element having a surface to which gold wires are connected;
   a pair of chip supports fixed to said semiconductor element so as to avoid portions of said semiconductor element, which are respectively connected to the gold wires;
   an adhesive injected between said pair of chip supports, for fixing said pair of chip support and said semiconductor element to each other; and
   a mold resin for sealing a back surface of said semiconductor element, which is located on the opposite side of the surface of said semiconductor element and a surface of said each chip support, which is located on the side opposite to a surface thereof fixed to said semiconductor element, so as to expose said both surfaces.

3. A structure according to claim 2, wherein said chip supports are respectively composed of horizontal and vertical portions integrally provided so as to be substantially L-shaped in cross section and are constructed so that tips of the horizontal portions of said chip supports are disposed face-to-face with each other.

4. A structure of a resin molded type semiconductor device, comprising:

   a semiconductor element having a surface to which gold wires are connected;
   chip supports disposed so as to avoid portions of said semiconductor element, which are connected to the gold wires and to extend from plural directions, said chip supports having a plurality of adhesive injection holes defined in tips thereof so as to vertically extend therethrough and being bonded to said semiconductor element with adhesives injected through the adhesive injection holes; and
   a mold resin for sealing a back surface of said semiconductor element, which is located on the opposite side of the surface of said semiconductor element and a surface of said each chip support, which is located on the side opposite to a surface thereof bonded to said semiconductor element, so as to expose said both surfaces.

5. A structure of a resin molded type semiconductor device, comprising:

   a semiconductor element having a surface to which gold wires are connected;

at least one pair of die pads disposed on a back surface of said semiconductor element, which is opposite to the surface of said semiconductor; and
a mold resin injected between said pair of die pads so as to bond between said pair of die pads, said mold resin bonding said pair of die pads and said semiconductor element to one another and sealing surfaces of said die pads, which are located on the side opposite to surfaces thereof bonded to said semiconductor element, so as to expose the opposed surfaces of said die pads.

6. A structure of a resin molded type semiconductor device, comprising:

a semiconductor element;
a plurality of leads respectively having adhesive injection holes defined in tips thereof provided on a surface of said semiconductor element;
an adhesive injected through said each adhesive injection hole, for bonding between said semiconductor element and said each lead; and
a mold resin for sealing said semiconductor element and said leads.

7. A structure of a resin molded type semiconductor device, comprising:

a semiconductor element having a surface to which gold wires are connected;
a chip support bonded to the surface of said semiconductor element so as to avoid portions of said semiconductor element, which are connected to the gold wires, said chip support having a projection provided on a surface on the opposite side of the bonded surface; and
a mold resin for sealing a back surface of said semiconductor element, which is located on the opposite side of the surface of said semiconductor element and a tip of the projection of said chip support so as to expose the back surface thereof and the tip thereof.

8. A structure of a resin molded type semiconductor device, comprising:

a semiconductor element having a surface to which gold wires are connected;
a chip support face-bonded to said semiconductor element with an elastic adhesive layer interposed therebetween so as to avoid portions of said semiconductor element, which are connected to the gold wires; and
a mold resin for sealing a back surface of said semiconductor element, which is located on the opposite side of said one surface of said semiconductor element and a surface of said chip support, which is located on the opposite side of a surface thereof bonded to said semiconductor element, so as to expose said both surfaces.

9. A structure of a resin molded type semiconductor device, comprising:

a semiconductor element having bonding pads formed on a surface thereof;
a plurality of inner leads respectively electrically connected to the bonding pads;
a metal plate bonded to said semiconductor element so as to avoid the bonding pads provided on the surface of said semiconductor element; and
a mold resin for sealing the other surface of said semiconductor element, which is located on the opposite side of the surface of said semiconductor element and a surface of said metal plate, which is located on the opposite side of a surface thereof bonded to said semiconductor element, so as to expose said both surfaces.

10. A structure according to claim 9, wherein said metal plate is a radiative metal plate.

11. A structure according to claim 10, wherein said radiative metal plate is selected from Cu, Al and Cu/W as a material.

12. A structure of a resin molded type semiconductor device, comprising:

a semiconductor element having bonding pads formed on a surface thereof;
a plurality of inner leads respectively electrically connected to the bonding pads;
a chip support thinner in thickness than each of said inner leads bonded to the surface of said semiconductor element so as to avoid the bonding pads; and
a mold resin for sealing the other surface of said semiconductor element, which is located on the opposite side of the surface of said semiconductor element and a surface of said chip support, which is located on the opposite side of a surface thereof bonded to said semiconductor element, so as to expose said both surfaces.

13. A semiconductor device structure having first and second major opposed substantially planar surfaces between which peripheral side edge portions extend, a semiconductor element (1), a chip support (3), a plurality of leads (5) that are exposed to

the exterior of the device, electrical connection wires (4) that provide electrical connections between the leads and pads (A1) on the semiconductor element, and resin molding material which encapsulates the device, wherein the chip support is adhered to the semiconductor element on the same side as the pads, the first major surface includes a surface of the chip support contiguous with a first surface of the resin molding material, and the second major surface includes a surface of the semiconductor element contiguous with a second surface of the resin molding material.

FIG. 1

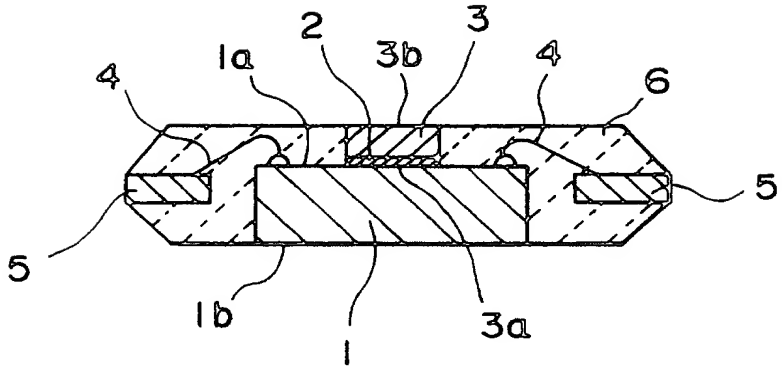


FIG. 2

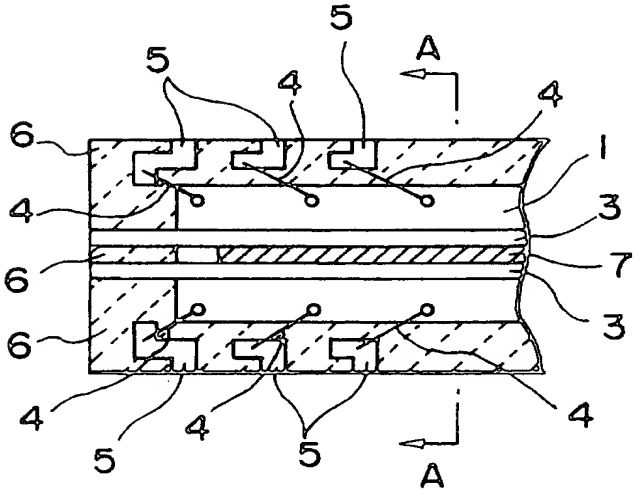


FIG. 3

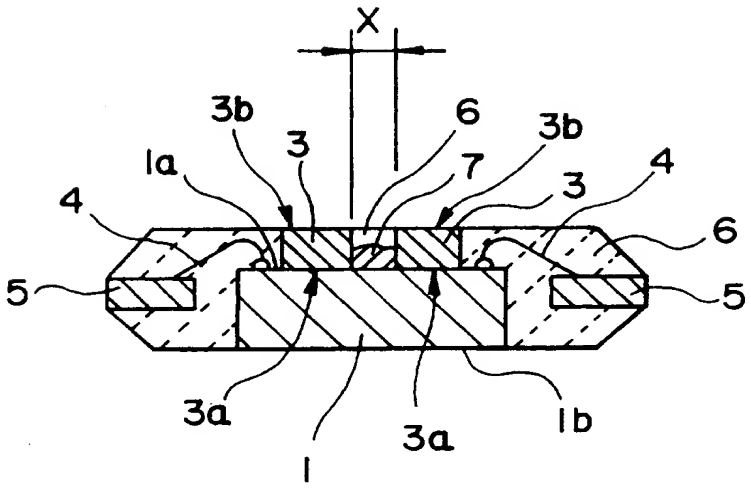


FIG. 4

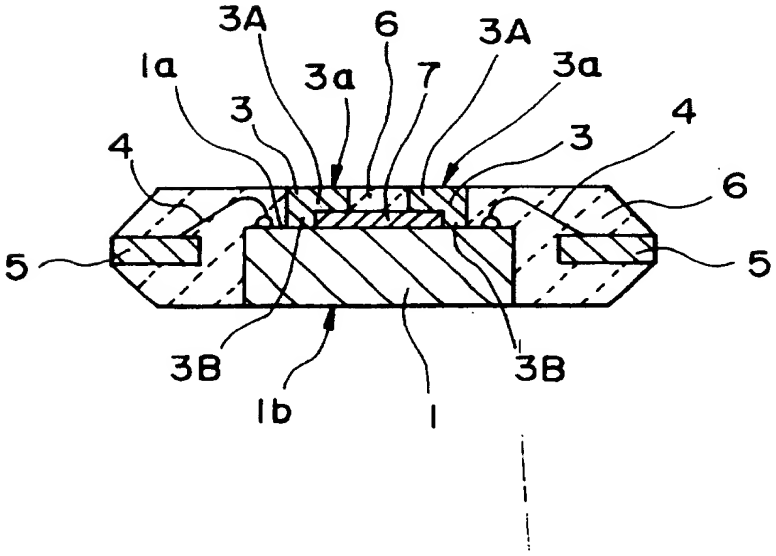


FIG. 5

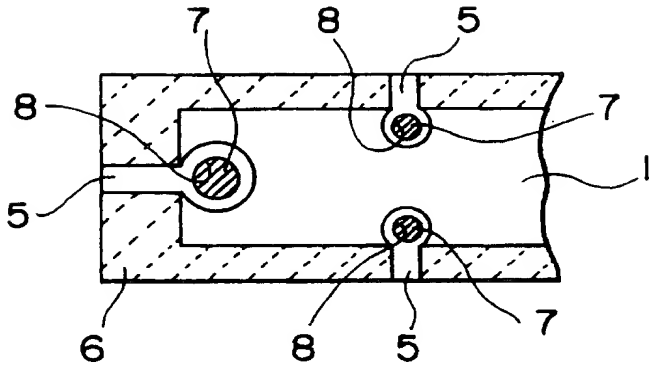


FIG. 6

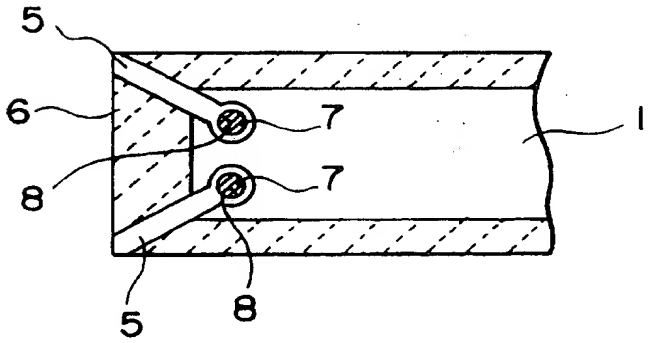


FIG. 7

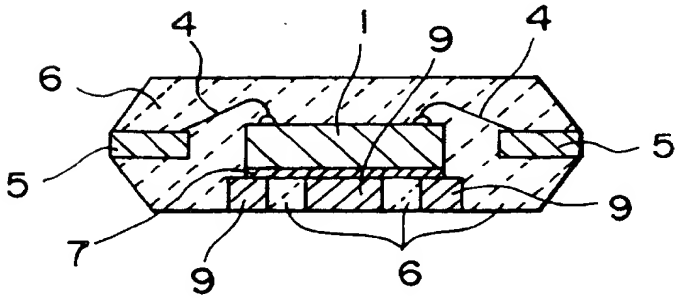


FIG. 8

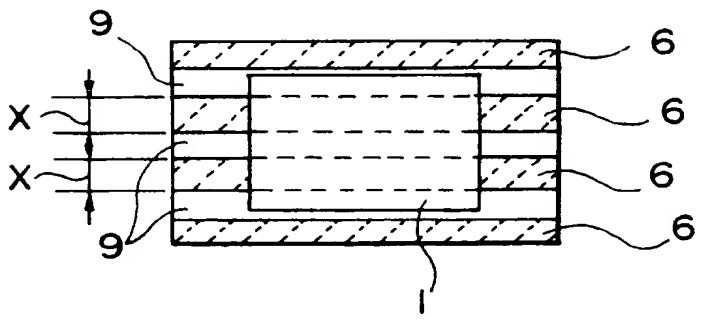


FIG. 9

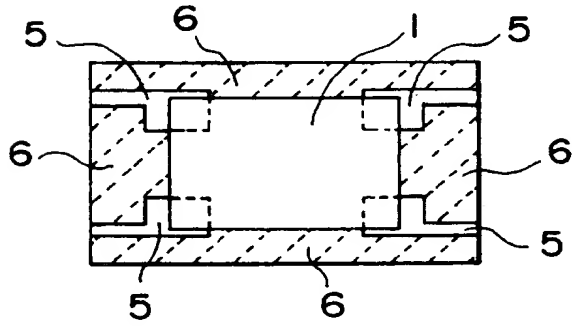


FIG. 10

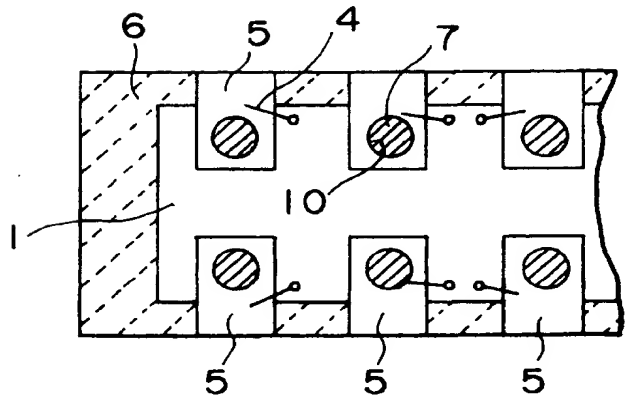


FIG. 11

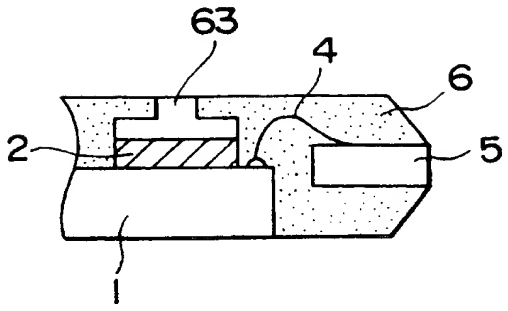


FIG. 12

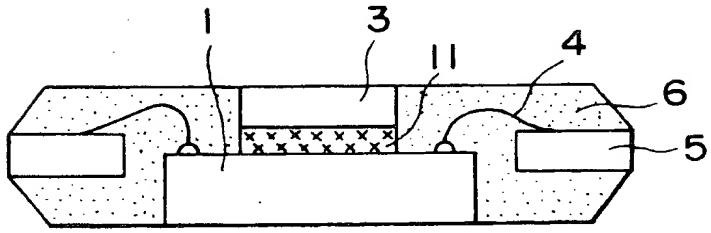


FIG. 13

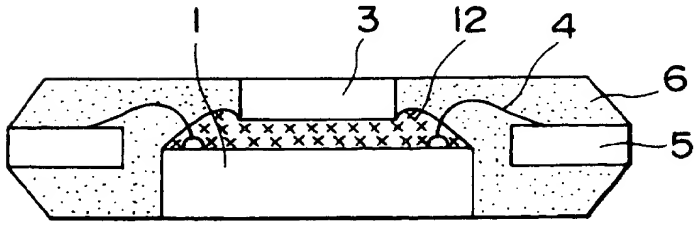


FIG. 14

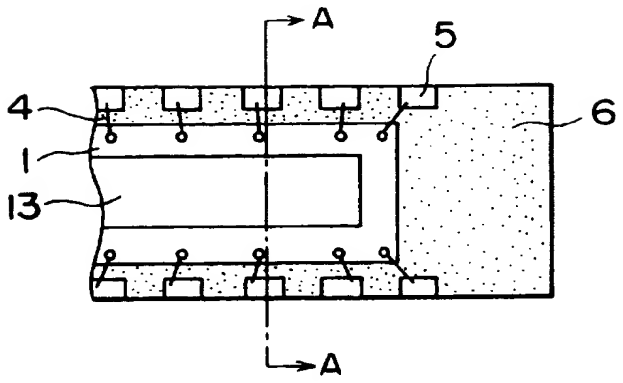


FIG. 15

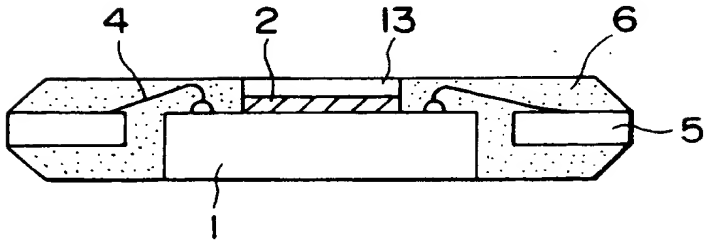
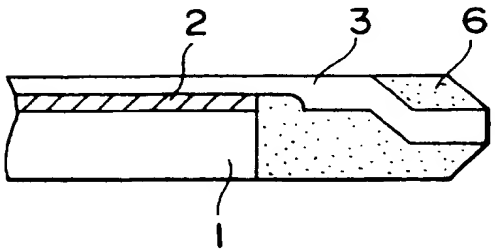


FIG. 16



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(71) Applicant: **Oki Electric Industry Co., Ltd.**
Tokyo (JP)

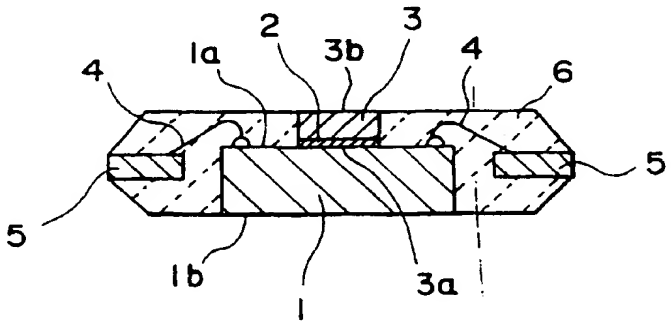
(72) Inventors:
- **Yamada, Etsuo, c/o Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)
- **Shiraishi, Yasushi, Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)
- **Kawano, Hiroshi,**
  c/o Oki Electric Industry Co.Ltd.
  Tokyo 105 (JP)
- **Ohuchi, Shinji, c/o Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)
- **Nasu, Hidekazu, c/o Oki Electric Industry Co.Ltd.**
  Tokyo 105 (JP)

(74) Representative: **Read, Matthew Charles et al**
Venner Shipley & Co.
20 Little Britain
London EC1A 7DH (GB)

(54) Structure of resin molded type semiconductor

(57) A resin molded type semiconductor device according to the present invention comprises a chip support (3) face-bonded to one surface of a semiconductor element (1), which is connected to gold wires (4), with an adhesive tape (2), so as to avoid portions of the semiconductor element (1), which are connected to the gold wires (4), and a mold resin (6) for sealing the other surface of the semiconductor element (1), which is located on the opposite side of one surface thereof and a surface of the chip support (3), which is located on the opposite side of a surface thereof bonded to the semiconductor element (1), so as to expose both the other surface (1b) of the semiconductor element and the surface (3b) of the chip support (3). Owing to the above construction, a thinned semiconductor device can be obtained.

FIG. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 7678

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 018, no. 120 (E-1516), 25 February 1994 & JP 05 315526 A (HITACHI LTD), 26 November 1993, * abstract * ---	1,8,13	H01L23/495 H01L23/433 H01L23/31
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 442 (E-1593), 17 August 1994 & JP 06 140542 A (MATSUSHITA ELECTRIC IND CO LTD), 20 May 1994, * abstract * ---	8	
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 227 (E-1360), 10 May 1993 & JP 04 359461 A (NEC CORP), 11 December 1992, * abstract; figure 3 * ---	4,6	
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 120 (E-1182), 26 March 1992 & JP 03 289163 A (HITACHI LTD), 19 December 1991, * the whole document * & US 5 391 916 A (RYUJI KOHNO AND AL.) 21 February 1995 * the whole document * ---	2,6	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01L
A	PATENT ABSTRACTS OF JAPAN vol. 015, no. 004 (E-1020), 8 January 1991 & JP 02 260558 A (NEC CORP), 23 October 1990, * abstract; figures 3A-3C * ---	6	
	-/--		

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 January 1997	Zeisler, P

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,

  namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,
namely:

See Sheet B.

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid.

  namely claims: 1, 8, 13, 2, 3, 4, 6, 9, 10, 11.
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.

  namely claims:

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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 7678

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 181 (E-750), 27 April 1989 & JP 01 007645 A (HITACHI LTD), 11 January 1989, * abstract; figures 6,7,16-18 *	6	
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 359 (E-1574), 6 July 1994 & JP 06 097353 A (SHARP CORP), 8 April 1994, * abstract; figure 2 *	4	
X	US 5 157 478 A (UEDA TETSUYA ET AL) 20 October 1992 * column 3, line 54 - line 68 * * column 5, line 44 - column 6, line 7; figures 1A,1B,5A,5B *	9-11	
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 015 (E-1305), 12 January 1993 & JP 04 245462 A (HITACHI LTD;OTHERS: 01), 2 September 1992, * abstract; figures 5,6,10 *	9,10	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	EP 0 508 266 A (MOTOROLA INC) 14 October 1992 * page 4, column 5, line 39 - column 6, line 45; figure 3 *	9-11	
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 455 (E-0985), 28 September 1990 & JP 02 181956 A (HITACHI LTD), 16 July 1990, * the whole document *	9-11	

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 January 1997	Zeisler, P

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X : particularly relevant if taken alone
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LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1: Claims: 1,8,13: Structure of a semiconductor device with exposed semiconductor backside and chip-support surface from encapsulation

2: Claims: 2,3,4,6: Structure of a semiconductor device with adhesive injected through chip-support(s) to fix semiconductor element

3: Claims: 5: Structure of a semiconductor device with at least one pair of die-pads, the die-pads backside exposed from encapsulation

4: Claims: 7,12: Structure of a semiconductor device having halfetched chip-support (projection or thinner die-support), the semiconductor backside and chip-support surface exposed from encapsulation

5: Claims: 9,10,11: Structure of a semiconductor device having a metal plate bonded to the surface of the semiconductor, the semiconductor backside and metal plate surface exposed from encapsulation